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SUMMARY

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ESTABLISHMENT OF PRODUCTION UNITS FOR CERAMIC PRODUCTS IN UNDER-DEVELOPED REGIONS

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ESTABLISHMENT OF PRODUCTION UNITS FOR CERAMIC PRODUCTS IN UNDER-DEVELOPED REGIONS

By
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1. AIM

The object of this communication is in the first place to determine the essential factors which must be taken into account in deciding on principles when setting up a ceramics factory and in the choice of a location.

We then propose to describe the general procedure of manufacture of ceramic goods, in order to familiarise listeners with the different steps in factory production.

We next seek to determine the smallest production which appears desirable, and the problems which arise, that is essential requirements of energy, labour and material.

2. FACTORS GOVERNING THE ESTABLISHMENT OF A CERAMICS FACTORY

It is essential to make an initial study of the market for ceramic goods. This market depends on the proposed construction programme and the setting-up of the factory must pay the greatest attention to the proximity of a substantial urban centre, which is almost essential: the transport factor as regards bulky and heavy products is of prime importance.

The next stage is to ensure that there is a sufficient deposit, as indicated by detailed tests, so that there is a source of raw material which will last for many years' production.

It will be necessary to analyse this clay so as to know its properties and to determine the mixtures of earths to be adopted in order to obtain good quality products.

The operation of a ceramics factory calls for a small number of highly skilled key workers, as well as a larger number of less specialised workers, who must attend regularly. It is therefore essential for the works to be situated in a region where this labour can be found, both skilled and unskilled; that probably means near a large town.

We must repeat that transport conditions are also a

determining factor. The products may be moved by road, rail, or water.

This industry makes use of electrical energy and of fuel. The fuel may be either wood, coal, or natural fuel or gas. It is evident that the proximity of an electricity supply and of a source of fuel are prime factors in the choice of the factory site.

3. GENERAL PROCESS OF MANUFACTURE

It now appears opportune to describe the general process of manufacture of ceramic articles, so as to give some idea of the successive steps involved.

The clay is first placed into store. In some cases it must be systematically stacked: this helps the ageing process to make it suitable for manufacturing purposes.

When the clay is brought into the works, it must then be prepared. This preparation often consists of mixing several clays and then adding a degreasing agent such as sand; the mixture is then ground, beaten, rolled and moistened in order to give a plastic paste suitable for shaping.

The shaping consists of pressing the paste through a mould which causes it to extrude with a definite profile. The material is then cut into separate units.

The product is then dried; the water may be removed naturally, or in chambers heated by the ovens, or in well-ventilated chambers into which hot air is passed, or in drying tunnels where the products pass through continuously.

Once the product is dry, it is ready for baking. This operation can be carried out in intermittent ovens, which are used less and less, or in ovens with moveable source of heat (Hoffmann ovens, ovens with parallel galleries); this procedure is now used most frequently.

4. CONSIDERATIONS ON A PRODUCTION UNIT OF 20 TO 50 TONS PER DAY

Experience shows that the least production to be a paying proposition is of the order of 20 tons per day. The following considerations are relevant to a unit producing more than 20 tons per day, e.g. one producing 50 tons per day, which would clearly be more profitable. Beyond about 50 tons we reach production problems calling for elaborate equipment and requiring an investment of a very different order of magnitude.

It is important to study the market from the outset so as to decide upon the product or products to be manufactured in the works. It seems logical to turn to those products in commonest use. For this reason we will limit our discussion to solid pressed bricks and to hollow ware.

It is to be noted that a factory producing solid pressed bricks calls for a smaller investment; indeed there is practically no need for preparation, as the clay passes straight from quarry to press.

As for choice of material, it is logical to have regard to basic factors such as the financial factor which often limits the investment available, and the desire to create new employment, which sets a limit to mechanisation.

It therefore appears reasonable to start thinking in terms of a quality product, but not necessarily one at the spear-head of progress.

We are of opinion that manual extraction from the quarry will often be adopted so as to limit the financial commitments.

Transport of the clay will be considered in terms of distance.

Preparation must be studied in terms of the clays available.

The mould will be of traditional design, with vacuum pump, for production in the cold.

It would be advantageous to provide for drying in chambers with good ventilation (duration: about 3 days) with a supply of hot air from the oven and from a supplementary hearth. We consider that natural drying, which is clearly the least costly, is not to be used, especially in countries where the relative humidity is often very high.

For the baking process, we advise the use of ovens with portable heating arrangement, such as the Hoffmann oven, which is not the most modern but which is particularly well adapted to productions of the magnitude we are discussing.

The thermal energy required can be calculated on a basis of 250 thermies per ton dried artificially, and for firing, 350 thermies per ton fired. These figures are averages subject to appreciable variations.

The electricity consumption is in the region of 26 kwh per ton fired.

The labour requirements comprise indirect workers and direct workers.

The total number of man-hours required per ton fired varies greatly according to the material used and the degree of mechanisation of the works, and of course according to the skill of the workers. Figures have been obtained ranging from less than 3, up to 6 hours per ton fired. It appears normal to allow a time of about 5 hours per ton, in countries in course of development; this figure is the total of direct and indirect labour. A works producing 50 tons per day would therefore require a labour force of about 30 persons.

5. PILOT BRICKWORKS AT NIAMEY (Niger Republic)

The TECHNICAL CENTRE FOR TILES AND BRICKS has been recently requested by the CENTRAL BUREAU FOR OVERSEA EQUIPMENT (B.C.E.O.M.) to set up a brickworks as a pilot scheme for the NIAMEY region.

Owing to space limitations, we cannot give complete data here, but only a summary.

6. CONCLUSIONS

We are of opinion that ceramics factories are among the first industrial plans to be considered by an underdeveloped country. These factories satisfy an essential need, that of construction, and they use a raw material existing on the spot. Finally, apart from key workers, the labour force required is unspecialised.

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